

REMARKS

Claims 1-3, 5-8, 10-14, 16-19, 21-25, 27, 28, 30-33, 35, 36, 38, and 41 are pending.
Claims 1, 6, 11, 16, 21, 27, 30, 35, 38, and 41 have been amended.

Applicant believes that this amendment addresses the Examiner's rejection and that any changes do not introduce new matter into the specification, limit the scope of the claims or result in any prosecution history estoppel.

Claim Rejections – 35 USC S. 103

The Examiner rejected claims 1-14, 16-19, 21-25, 27, 28, 30-33, 35, 36, 38 and 41 under 35 U.S.C. 103(a) as being unpatentable over Wu et al (US 6,700,933). Applicant respectfully traverses the Examiner's rejection. In particular, Wu fails to teach or suggest the enhancement encoding and decoding processing is independent of any intermediate data in the base layer as a result of a change in the calculation of the enhancement layer quantization residue *wherein an enhancement residual addition applies to a final base layer output after a base layer clipping operation* as claimed or similarly claimed.

The Examiner notes that

While Wu fails to disclose the enhancement processing is independent of any intermediate data in the base layer, Wu does disclose that the enhancement or higher quality layers are predicted from at least the same or lower quality layer, but not necessarily the base layer (Wu: column 7, lines 17-20). The examiner notes that in the cases where multiple enhancement layers are used, as shown in Wu's figures 4-5, the enhancement layers can be processed without using information from the base layer. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made to implement the enhancement processing independent of data in the base layer in order to obtain an apparatus that operates more efficiently by not relying on data from previous calculations.

As noted in the specification on page 8, paragraph [022] of the present application:

Embodiments of the present invention provide a post-clipping method in the coding system for fine granularity scalability (FGS) video coding and is applicable to both encoders and decoders. The fine granularity scalability (FGS) enhancement layer encoding and decoding operations can be mapped to simple motion compensation operations. Consequently, they can be implemented by using existing data and control paths in the base layer encoder and decoder. The base layer encoder and decoder thus need not be changed. **The post-clipping method and apparatus for improving enhancement layer video coding results in simplicity in multiple-layer video coding. Additionally, it**

also allows the FGS video coding to be extended with spatial scalability. The enhancement encoding and decoding processing is independent of any intermediate data in the base layer 30 as a result of a change in the calculation of the enhancement layer quantization residue as described in detail below. [Emphasis added]

Also, as noted on page 12, paragraph [053]:

The present invention provides a **post-clipping** method in the coding system for fine granularity scalability (FGS) video coding and is applicable to decoders as well. The fine granularity scalability (FGS) enhancement layer decoding operation can be mapped to simple motion compensation operations. Consequently, they can be implemented by using existing data and control paths in the base layer decoder. The base layer decoder thus needs not be changed. Referring to FIG. 5, in one embodiment, the enhancement layer decoder 100 is independent of any intermediate data in the base layer decoder 86 as a result of a change in the calculation of the enhancement layer residue. In particular, the enhancement residual addition applies to the final base layer output after the base layer clipping operation. Therefore, it is referred to as a post-clipping addition method, or simply a post-clipping method. Similar to the encoder 30 shown in FIG. 4, the decoder for the post-clipping addition method also decouples the base layer decoding process and enhancement layer decoding process. In fact, the enhancement layer decoding process can be mapped into a simple motion compensation case using the base layer picture as reference. The enhancement layer decoder thus does not depend upon intermediate base layer data during the decoding process. [Emphasis added]

Wu fails to teach or suggest the enhancement encoding and decoding processing is independent of any intermediate data in the base layer as a result of a change in the calculation of the enhancement layer quantization residue wherein an enhancement residual addition applies to a final base layer output after a base layer clipping operation as claimed or similarly claimed. The configuration shown in Wu in fact teaches away from the claimed invention and is similar to that described in the background of the present application on paragraphs [0013] and [0014]:

[0013] In the conventional simplified encoder shown in FIG. 1, the bit-plane shift unit applies operation on the residue values using Eq. 5. The enhancement layer encoder 14 differs from a base-layer encoder 12 by introducing a residual calculator and a separate encoding pipe. **The residual calculation thus relies on intermediate data 18 from the base layer encoder 12.** However, the change of encoder structure is typically minimal, since both the original DCT coefficient ($coeff[n]$) and reconstructed base layer DCT coefficient ($rcoeff[n]$) already exist in the base layer process 12. [Emphasis added]

[0014] Referring to FIG. 2, a conventional simplified FGS **decoder 20** is illustrated. The FGS enhancement layer decoding process 22 is the reverse of

the above-described enhancement layer encoding process 14. **Since the restoration of DCT coefficients for the enhancement layer 22 requires access to the DCT coefficients in the base layer encoder 24, as denoted by path "A", the decoding process of both the enhancement layer decoder 22 and base layer decoder 24 is coupled. In other words, intermediate data 26 in the base layer decoder 24 needs to be stored or the enhancement and base layer decoding processes must run concurrently in order to share data. These restrictions also apply to other forms of intermediate data 26, such as motion prediction results. As denoted by path "B", the enhancement layer decoder 22 needs to access the base layer motion prediction results to form the final enhancement reconstruction. The resultant cross-coupling between the enhancement and base layers introduce encoder and decoder design complexity.** [Emphasis added]

In particular, the Examiner cites Figure 20 of Wu which is similar to Figure 2 (prior art) in the present application. Since the restoration of DCT coefficients for the enhancement layer requires access to the DCT coefficients in the base layer encoder, the decoding process of both the enhancement layer decoder and base layer decoder in Wu is coupled. The enhancement layer decoder also accesses the base layer motion prediction results to form the final enhancement reconstruction. In particular, as shown in FIG. 20 (cited by Examiner) and noted in column 21, lines 23-56 of Wu:

FIG. 20 shows the complementary video decoder 98', which may be implemented by client 66, to decode the video data files received over the network 64 (FIG. 3). The decoder 98' has a bit layer decoder 602 that decodes the bitstream for the base layers and two enhancement layer decoders 604 and 606 that decode the bitstream to recover the enhancement layers. The decoder 98' also has an advance prediction bit-plane coder (APBIC) 610, that is essentially identical to the encoder-side APBIC 510 in FIG. 19.

A variable length decoder (VLD) module 620 decodes the bit stream for the base layer to recover the quantized LQPD coefficients. Motion vectors (MVs) from the decoding are passed to motion compensators 622 and 624. **These coefficients are dequantized by a dequantizer (i.e., the "Q.sup.-1" module) 626 and then passed through an inverse DCT (IDCT) transform 628 to reconstruct the base layer. The reconstructed base layer is summed via summation 630 with a predicted base layer from the motion compensator 622, clipped by clipping module 632, and output. The reconstructed base layer is also stored in frame buffer 634.**

A combined VLD and bit plane decoder module 640 decodes the bit stream carrying the lower quality DCT residues. The recovered DCT coefficients are summed via summation 642 with the dequantized LQPD coefficients from the base layer decoder 602 to reproduce the encoded DCT (ECD) coefficients. The ECD coefficients are passed to an IDCT transformer 644 to reconstruct the enhancement layer. The reconstructed enhancement layer is summed via summation 646 with either a predicted base layer from the

motion compensator 622 or a predicted enhancement layer from the motion compensator 624, depending upon the position of switch 648. The compensated enhancement layer is clipped by clipping module 650 and output. The reconstructed enhancement layer is also stored in frame buffer 652.
[Emphasis added]

In view of the foregoing, it is respectfully asserted that all of the claims pending in this patent application are in condition for allowance.

CONCLUSION

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of time fees.

If the Examiner has any questions, he is invited to contact the undersigned at (323) 654-8218. Reconsideration of this patent application and early allowance of all the claims is respectfully requested.

Respectfully submitted,

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Margaux Rodriguez

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